BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

IMAGES ARE BEST AVAILABLE COPY.

As rescanning documents *will not* correct images, please do not report the images to the Image Problem Mailbox.

(19) Eur päisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 062 976**
B1

(12) # EUROPEAN PATENT SPECIFICATION

(45) Date of publication of patent specification: **28.11.84**

(51) Int. Cl.³: **H 04 Q 11/04**, H 04 M 3/60

(21) Application number: **82301426.1**

(22) Date of filing: **19.03.82**

(54) **Switchboard control system.**

(30) Priority: **20.03.81 JP 41353/81**

(43) Date of publication of application:
20.10.82 Bulletin 82/42

(45) Publication of the grant of the patent:
28.11.84 Bulletin 84/48

(84) Designated Contracting States:
BE DE FR GB SE

(56) References cited:
EP-A-0 018 910
WO-A-79/00316

NATIONAL TELECOMMUNICATIONS CONFERENCE, Conference Record, vol.2, November 27-29, 1979, IEEE, Washington D.C. (US)
COMMUTATION & TRANSMISSION, vol. 2, no. 3, September 1980, Paris (FR) J. CHARPENTIER et al.: "Les positions d'operatrice dans le système MT", pages 117 to 132

(73) Proprietor: **FUJITSU LIMITED**
1015, Kamikodanaka Nakahara-ku
Kawasaki-shi Kanagawa 211 (JP)

(72) Inventor: **Harada, Hidemi**
19-7, Ekiminami-cho, 1-chome
Oyama-shi Tochigi, 323 (JP)
Inventor: **Nagahama, Yasushi**
5-23, Shinohara Kita 2-chome Kohoku-ku
Yokohama-shi Kanagawa, 222 (JP)
Inventor: **Matsuura, Yoshiaki**
4-2, Kajigaya 2-chome Takatsu-ku
Kawasaki-shi Kanagawa 213 (JP)
Inventor: **Aoki, Kenzo**
473, Hisasue, Takatsu-ku Kawasaki-shi
Kanagawa Maison Hisasue 106, 213 (JP)
Inventor: **Takahashi, Atsuhisa**
5-3 Nijigaoka Tama-ku Kawasaki-shi
Kanagawa, 215 (JP)

(74) Representative: **Sunderland, James Harry et al**
HASELTINE LAKE & CO Hazlitt House 28
Southampton Buildings Chancery Lane
London WC2A 1AT (GB)

EP 0 062 976 B1

Courier Press, Leamington Spa, England.

(56) References cited:
INTERNATIONAL SWITCHING SYMPOSIUM, session 31A, May 11, 1979, Paris (FR) H. SUEYOSHI et al.: "Un systeme de commutation temporelle d'utilisation souple pour centre urbain NEAX 61", pages 688 to 695
NATIONAL TELECOMMUNICATIONS CONFERENCE, Conference Record, vol. 2, November 27-29, 1979, IEEE, Washington D.C. (US) D.FERENCE : "The evolution of a digital switching system to include integrated operator services", pages 28.5.1 to 28.5.5

Description

The present invention relates to a switchboard control system, and more particularly to a switchboard control system for a time division exchange in which a plurality of switchboards are connected to a time division network.

Generally, in a toll switch and an international switch, equipment associated with a switchboard is set up as an annex to a time division exchange for calls that are required to be connected by the switchboard operator.

In this kind of switchboard control system, as described, for instance, in "NXE-20 International Telephone Switching System", NEC Research & Development, No. 54, July, 1979, p88—105, each switchboard has a voice signal line connected to a network and a control signal line connected to a central controller, and connection among a trunk, a switchboard and a position trunk accommodated in a time or space division network is carried out by controlling the network with the central controller.

This will be described in more detail. When the central controller of a time division exchange, decides that an incoming call from a trunk line calls for connection by a switchboard, the central controller sends out incoming indicating information to one of a plurality of switchboards that is selected following predetermined procedure. As soon as the operator of the switchboard answers using an answer key, the central controller detects the operation of the answer key, and it acquires an idle position trunk (having three terminals F, R nd P) and controls the network to connect the terminal F of the position trunk and a trunk accomodating the incoming trunk line and to connect the terminal P of the position trunk and the switchboard having answered. The operator of the switchboard asks the calling party the classification of the call, the calling party's number, the called party's number and so forth and then operates an input key to enter information necessary for preparing a toll ticket. The central controller, when detecting information on the operation of the input key, sends the toll ticket information to a display on the switchboard for display. At the same time, the information is stored in a memory. Upon actuation of a called party select key by the operator of the switchboard, the central controller detects the operation of the called party select key, and it acquires a trunk accomodating an idle trunk line connected to the called subscriber and controls the network to connect the acquired trunk and the terminal R of the position trunk, performing processing for connection of the called party. The central controller detects an answer from the called party via the trunk and controls a predetermined lamp on the switchboard to indicate the detection. When the operator operates a disconnect key after confirming communication between the calling and the called party, th central controller detects the operation of the disconnect key and controls the network, disconnecting the terminal P of the position trunk from the switchboard.

As will be appreciated from the above, the prior art switchboard control system has such disadvantages as follows:

First, each switchboard must be provided with a voice signal line connected to the network and, consequently, the voice signal line and a trunk are needed between each switchboard and the network, making the system configuration uneconomical.

Secondly, a control signal line must be provided between each switchboard and the central controller for transmitting operation information of various keys of the switchboard, display information for various display instruments and information for exchange processing. Since the information to be transmitted includes a large quantity of information such as toll ticket information or directory assistance information, large-capacity information transmitting means is required; in addition, the transmission admits of no delay. If a known common bus system is employed for the control signal line, then its length is limited, imposing limitations on the distance between the switchboard and the time division exchange.

Thirdly, if a MODEM is introduced into the control signal line for increasing the length between the switchboard and the automatic exchange, then the transmission rate is reduced and, an increase in the number of such MODEMs used so as to compensate for the reduced transmission rate would be further uneconomical.

EP—A—0 018 910 discloses a system for connecting an attendant desk to a digital telephone exchange. Speech and control signals are transmitted between the attendant desk and the digital exchange over a single signal line on a time-division-multiplexed basis. The format for transmission and reception of control signals between a controller of the attendant desk and a controller of the exchange is 32 frames/multiframe. The data transfer channel is fixed and data transmission and reception is performed at a transfer rate different from that of a voice channel. A channel associated signalling system is used.

The document "Commutation and Transmission", Vol. 2, No. 3, September 1980, pages 117 to 132 discloses a system in which speech and control signals are transmitted from operator positions by separate channels. Control signals from a plurality of positions are multiplexed separately from speech from those positions.

According to the present invention there is provided a switchboard control system for a time division exchange having a plurality of switchboards connected to a time division network, comprising:

a time division multiplex transmission line common to speech signals and control signals

to be transferred between the switchboards and the time division exchange, for transmitting the speech and control signals on a time-division-multiplexed basis;

a position controller for multiplexing the speech and control signals from the switchboards and inputting them to the common time division exchange and separating time-division-multiplexed speech and control signals sent via the time division multiplex transmission line from the time division exchange and inputting the separated signals to the switchboards,

wherein the control signals are transmitted via a route including the common time division multiplex transmission line between a common channel signalling equipment provided in the time division exchange and a remote common channel signalling equipment provided in the position controller, and via a control signal line provided separately of a speech signal line between the remote common channel signalling equipment and each switchboard; and

a centralized display equipment on which information of the status of exchange service and circuit status sent out as a display signal from the time division exchange can be displayed for all switchboard operators.

It is an object of the present invention to provide a switchboard control system for a time division exchange having a plurality of switchboards connected to a time division network which permits economical construction of a voice signal line, a control signal line and an associated control unit for each switchboard.

Another object of the present invention is to provide a switchboard control system for a time division exchange having a plurality of switchboards connected to a time division network which economically eliminates limitations on the distance between each switchboard and the time division exchange.

Another object of the present invention is to provide a switchboard control system for a time division exchange having a plurality of switchboards connected to a time division network which permits easy setting of a counter-measure for trouble by duplexing a common channel signalling equipment for control signals which are delivered and received between the switchboards and the time division exchange.

Another object of the present invention is to provide a switchboard control system for a time division exchange having a plurality of switchboards connected to a time division network which facilitates decentralization of the load on a processing unit for control signals delivered and received between each switchboard and the time division exchange by dividing the processing unit into two on the side of the switchboard and on the side of the time division exchange.

Brief description of the drawings

Fig. 1 is a connection diagram showing an example of conventional switchboard control system;

Figs. 2 and 2A are connection diagrams illustrating the general arrangement of an embodiment of the present invention;

Fig. 3 shows, by way of example, the frame structure of a PCM transmission line in the embodiment of Fig. 2;

Fig. 4 is a connection diagram showing in detail the arrangement of a position controller PSC' in the embodiment of Fig. 2;

Fig. 5 is a connection diagram illustrating in detail the arrangement of a time division switch in the embodiment of Fig. 2; and

Fig. 6 is a connection diagram showing in detail an example of a network applicable to the embodiment of Fig. 2A.

Description of the preferred embodiments

Fig. 1 illustrates, by way of example, the arrangement of a prior art switchboard control system for a time division exchange in which switchboard-related equipment is set up as an annex thereto.

In Fig. 1, pluralities of trunks TRK, switchboards SWBD and position trunks PST are accomodated in a time division or space division network NW. Now, let it be assumed that a central controller CC of the time division exchange has decided that an incoming call from a trunk line A calls for connection by a switchboard. The central controller CC sends out incoming indicator information to a selected one of the plurality of switchboards SWBD via a channel controller CHC, a position controller PSC provided in common to the switchboards SWBD and a control signal line CL. As soon as the operator of the selected switchboard SWBD answers operating an answer key, the central controller CC detects the operation of the answer key via the control signal line CL, the position controller PSC and the channel controller CHC. Then the central controller CC seizes an idle position trunk PST (having three terminals F, P and R) and controls the network NW to connect the terminal F of the seized position trunk PST with the trunk TRK accomodating the trunk line A and the terminal P of the position trunk PST with a trunk TRKP of a voice signal line VL of the switchboard SWBD having answered. The operator of the switchboard SWBD inquires of the calling subscriber about the classification of call, the calling subscriber's number, the called subscriber's number and so forth, and then operates input keys to enter information necessary for preparing a toll ticket. The central controller CC detects the operation of the input keys via the control signal line CL, the position controller PSC and the channel controller CHC, and sends the toll ticket information via the channel controller CHC, the position controller PSC and the control signal line CL to a display PDP on the switchboard SWBD for display. At the same time, the toll ticket information is stored in a

memory not shown. Upon actuation of a called party select k y by the operator of the switchboard SWBD, the central controller CC detects it via the control signal line CL, the position controller PSC and the channel controller CHC. Then the central controller CC seizes a trunk TRK accomodating an idle trunk B connected to the called party, and controls the network NW to connect the seized trunk TRK to the terminal R of the position trunk PST, performing processing for connection of the called party. Upon detection of an answer of the called party via the trunk TRK, the central controller CC controls a predetermined lamp on the switchboard SWBD via the channel controller CHC, the position controller PSC and the control signal line CL, indicating that called party has answered. When the operator actuates a disconnect key after confirming communication between the calling and the called subscriber, the central controller CC detects the operation of the disconnect key via the control signal line CL, the position controller PSC and the channel controller CHC, and it controls the network NW to disconnect the terminal P of the position trunk PST from the trunk TRKP of the voice signal line VL leading to the switchboard SWBD.

As is evident from the above, the conventional switchboard control system has such shortcomings as follows: Firstly, it is necessary that each switchboard be provided with the voice signal line VL and the trunk TRKP with respect to the network NW, resulting in the system configuration becoming uneconomical. Secondly, the control signal line CL and the position controller PSC must be provided for transmitting a control signal between each switchboard SWBD and the central controller CC. In this case, however, since the control signal to be transmitted is large in quantity and should not be delayed, the control signal line CL is required to transmit a large quantity of information at high speed. If the control signal line were constituted using a known common bus system, it would be limited in length, imposing limitations on the distance between the switchboard and the automatic exchange. Thirdly, if special transmitting means, for instance, a known MODEM or the like, were introduced for increasing the distance between the switchboard and the automatic exchange, the manufacturing costs would be further increased. The present invention offers a solution to such problems encountered in the past.

Figs. 2 and 2A illustrates the general arrangement of a specific example of the present invention, and Fig. 3 shows, by way of example, the frame structure of a PCM transmission line employed in Figs. 2 and 2A. In the illustrated example, a network NW' which accomodates the pluralities of trunks TRK and position trunks PST is the time division type. The plural, for instance, 30 switchboards SWBD are accomodated in the time division network NW' via a common position controller PSC', a common PCM highway lin HW and a digital terminal DT. A frame F that is rep ated with the period of the PCM highway HW, 8 KHz, includes, for instance, 32 time slots TS as shown in Fig. 3. Each time slot TS transmits an eight-bit PCM code. In Fig. 3, a time slot TS≠0 is used for transmitting maintenance information on the switchboard SWBD, time slots TS≠1 to TS≠15 and TS≠17 to TS≠31 are respectively used for transmitting voice signals transmitted and received by the 30 switchboards SWBD, and a time slot TS≠16 is used for transmitting controlling signals which convey a variety of information transmitted and received by the 30 switchboards SWBD, such as operation information of various keys, display information for various display units, including the display PDP and other information for exchange processing. The voice signal sent out from the switchboard SWBD is led via the voice signal line VL to a coder-decoder CODEC of the position controller PSC', wherein it is rendered into an eight-bit PCM code, which is time-division multiplexed by a multiplexer/demultiplexer MPX/DMPX. The time-division multiplexed signal is sent out via the digital terminal DT into one of the time slots TS≠1 to ≠15 and ≠17 to ≠31 of the PCM highway HW. On the other hand, a PCM coded voice signal which is provided from each of the time slots TS≠1 to ≠15 and ≠17 to ≠31 of the PCM transmission line HW to the position controller PSC' is applied to the multiplexer/demultiplexer MPX/DMPX and subjected to the abovesaid processes in the reverse order, thereafter being fed to one of the switchboards SWBD via the voice signal line VL. Accordingly, one position controller PSC' permits communication of voice signals of the 30 switchboards SWBD. The aforesaid control signal transmitted and received by each switchboard SWBD is provided via the common control signal line CL to a remote common channel signalling equipment RCSE of the position controller PSC', wherein it is coded into a predetermined form (for example, CCITT signalling system No. 7) or decoded. The coded or decoded signal is provided via the multiplexer/demultiplexer MPX/DMPX and the digital terminal DT on the PCM highway HW which is accomodated is transmitted in its time slot TS≠16. The time slot TS≠16 of the PCM highway HW which is accomodated in the time division network NW' via the digital terminal DT is semi-fixedly connected with common channel signalling equipment CSE via the time division network NW', and the aforementioned control signal is transmitted in the aforesaid coded form to the common channel signalling equipment CSE. With such an arrangement described above, the control signal indicating information of the key operation of each switchboard SWBD is transmitted to the central controller CC via a common channel signal link constituted by the remote common channel signalling equipment

RCSE of the position controller PSC', the time slot TS#16 of the PCM highway HW and the common channel signalling equipment CSE. The control signal indicating display information for various display units of each switchboard SWBD, such as the plasma display panel PDP and lamps, which is sent out from the central controller CC, is transmitted via the abovesaid common channel signal link to the switchboard SWBD. On the other hand, the time slots TS#1 to #15 and #17 to #31 of the PCM high way HW are each connected to the terminal P of a predetermined position trunk PST via the time division network NW' on the basis of designation by the central controller CC, enabling communication between the operator of the switchboard SWBD and a subscriber. The processing steps for the connection of a call which requests a connection by the switchboard SWBD are the same as described previously in respect of Fig. 1. In this case, control signals that are delivered and received between the central controller CC and the switchboard SWBD and voice signals that are exchanged between the operator of the switchboard SWBD and the calling and the called party, are all transmitted via the PCM highway HW which is a common transmission line.

As will be appreciated from the above, according to this embodiment, the 30 switchboards SWBD are accomodated in the time division exchange via the PCM highway which constituted one common transmission line. And the control signals that are transferred between each switchboard and the central controller CC and the voice signals that are exchanged between the switchboard operator and the calling and the called subscriber, are all transmitted via the PCM highway HW.

Accordingly, any voice signal lines and trunks need not be provided between the respective switchboard SWBD and the network NW', and the transmission line for the control signals between each switchboard SWBD and the central controller CC is only the PCM highway HW. Therefore, no limitations are imposed on the distance between each switchboard and the time division exchange and the cost of the transmission line for the speech signal and the control signal is markedly cut down as a whole by using the transmission in common to them. In Fig. 2, reference character CDE indicates a centralized display equipment, on which information of the status of exchange service and the circuit status sent out as a display signal from the time division exchange can be displayed for all switchboard operators.

Fig. 4 illustrates in detail the arrangement of the position controller PSC' in Fig. 2. In Fig. 4, reference characters SLC_1, SLC_2,...SLC_n indicate switchboard line circuits, each connected via a voice signal line VL to one switchboard (SWBD), and RCSE designates a remote common channel signalling equipment, which is connected via a control signal line CL to each switchboard and to the abovesaid centralized display equipment CDE.

As the switchboard line circuits SLC_1 to SLC_n are identical in construction, a detailed description will be given of the switchboard line circuit SLC_1 alone. A speech signal transmitted from the switchboard via the voice signal line VL is branched by a hybrid HB to the direction of transmission and encoded by the coder-decoder CODEC into a PCM code, which is applied via a line driver D to a multiplexer MPX.

In the remote common channel signalling equipment RCSE, a control signal of digital form sent via the control signal line CL from each switchboard is received by a line receiver R_1 and sent via a data link controller DLC_1 and a common bus B to a processor unit PU, wherein it is subjected to necessary processing. Then the control signal is provided to the multiplexer MPX via a data link controller DCL_2 and a line driver D_2.

To the control signal line CL are connected the respective switchboards in parallel relation and, in this case, a known common bus system is employed so as to prevent interference of the control signals from the switchboards. Since the remote common channel signalling equipment RCSE can be installed in proximity to the switchboards, no limitations are imposed on the distance between each switchboard and the time division exchange even if the control signal line CL is constituted using the common bus system.

In the remote common channel signalling equipment RCSE, a memory MEM operates in association with the processor unit PU, and the data link controllers DLC_1 and DLC_2 are permitted direct access to the memory MEM through a direct memory access controller DMAC.

The speech signal transmitted from each switchboard to one of the subscriber circuits SLC_1 to SLC_n and the control signal transmitted from each switchboard to the remote common channel signalling equipment RCSE are time-division multiplexed by the multiplexer MPX and provided via the digital terminal DT to an upward highway, over which they are sent to the side of the time division exchange.

From the time division exchange are transmitted a speech signal and a control signal over a downward highway DHW to each switchboard. These signals are provided via the digital terminal DT to a demultiplexer DMPX, wherein they are separated.

The speech signals to the respective switchboard are separated by the demultiplexer DMPX for each of the switchboard line circuits SLC_1 to SLC_n, i.e. distributed thereto. In the case of the switchboard line circuit SLC_1, the speech signal separated by the demultiplexer DMPX is received by a line receiver R in the switchb ard line circuit SLC_1 and applied to the coder-decoder CODEC, wherein it is decoded int a

voice signal, which is transmitted from the hybrid HYB to th switchboard via the voice signal lin VL.

The control signals to the respective switchboards are separated by the demultiplexer DMPX into individual signals. Each control signal is applied to the remote common channel signalling equipment, wherein it is received by a line receiver R_2. The received signal is supplied to the data link controller DLC_2 and then provided via the bus B to the processor unit PU, which performs predetermined processing of the signal in cooperation with the memory MEM. Thereafter, the control signal is provided on the control signal line CL via data link controller DLC_1 and a line driver D_1.

To the control signal line CL are connected the switchboards. The control signal can be transferred to a predetermined switchboard through the known common bus system.

In the above, the time slots TS≠16 of the signal frames F of the upward and downward highways UHW and DHW can be assigned to the signal provided from the remote common channel signalling equipment RCSE to the multiplexer MPX and the signal from the demultiplexer DMPX to the remote common channel signalling equipment RCSE, as described previously with respect to Fig. 3.

Reference character CTL identifies a controller for the multiplexer MPX and the demultiplexer DMPX, which is supplied with synchronizing pulses from the digital terminal DT to control the timing of the multiplexing and separation.

Fig. 5 illustrates in detail the arrangement of the time division exchange used in the specific example shown in Fig. 2A. In Fig. 5, the parts corresponding to those in Fig. 2A are identified by the same reference characters. In the common channel signalling equipment CSE, reference character D indicates a line driver; R designates a line receiver; DLC identifies a data link controller; DMAC denotes a direct memory access controller; B represents a common bus; PU shows a processor unit; MEM shows a memory; and LIF signifies a line interface circuit.

Let it be assumed that the network NW' transfers a signal in the direction indicated by an arrow, and that the ends of lines indicated by corresponding numerals are interconnected directly (without passing through the network NW'). For instance, the ends of lines marked with ① and ① are interconnected directly.

An input line from a trunk or like unit to the network NW' and an output line therefrom to the unit are shown at the same level on the left and right sides of the network NW', respectively.

As will easily be seen from Fig. 5, the network NW' is connected via the upward and downward highways UHW and DHW to the position controller PSC' in Fig. 4, and the time slots TS≠16 of the upward and downward highways UHW and DHW for the control signal are semi-fixedly c nnect d to the common channel signalling equipment CSE through th network NW' as indicated by the broken lines 16C and 16C'.

When deciding that an incoming call from the trunk line A requesting a connection by the switchboard SWBD, the central controller CC of the time division exchange sends an incoming indicator signal to one of the plurality of switchboards SWBD which is selected following a predetermined procedure. This signal is provided from the central controller CC via the channel controller CHC to the line interface circuit LIF of the common channel signalling equipment CSE, and it is subjected to predetermined processing in the processor unit PU which cooperates with the memory MEM, thereafter being applied via the common bus B and the data link controller DLC to the line driver D to be sent out therefrom. This control signal is outputted at the timing of the time slot TS≠16 of the downward highway DHW and it is sent from a line end ⑦ via the route 16C' of the network NW' to a line end ⑥, from which it is sent out via the digital terminal DT and over the time slots TS≠16 of the signal frame F of the downward highway DHW to the position controller PSC'. The control signal is further transferred to the switchboard SWBD selected as referred to previously. When the operator of the selected switchboard SWBD answers by operating the answer key, the central controller CC detects the operation of the answer key through the control signal line CL, the position controller PSC' and the upward highway UHW on the side of the switchboard and the digital terminal DT, the upward highway UHW', the network NW', the line 16C and the common channel signalling equipment CSE on the side of the time division exchange. The central controller CC seizes an idle position trunk PST and controls the network NW', by which the terminal F of the position trunk PST is connected via routes 1S and 1S' to the trunk TRK accomodating the trunk line A and a speech channel corresponding to the time slot for conveying speech signals transferred to and from the switchboard is extended to the terminal P of the position trunk PST via routes 2S and 2S'. The operator of the switchboard SWBD inquires of the calling party about the classification of call, the calling party's number and the called party's number, and operates an input key to enter information necessary for preparing a toll ticket. The central controller CC detects information of the operation of the input key via the same route as that of the aforementioned signal of the operation information of the answer key and sends the toll ticket information to the plasma display panel PDP on the switchboard SWBD via the same route as that of the aforesaid incoming indicator signal. Thus th toll ticket information is displayed and, at the same time, it is stored in a memory not shown. Upon actuation f the

called subscriber select key by the operator of the switchboard SWBD, the central controller CC detects the operation of the called subscriber select key in the same manner as described previously. Then the central controller CC seizes a trunk TRK accomodating an idle trunk line B leading to the called subscriber, and controls the network NW' to connect the trunk TRK to the terminal R of the position trunk PST via routes 3S and 3S', performing the processing for connection of the called party. Upon detection of an answer from the called party via the trunk TRK, the central controller CC sends out a control signals as described previously to control a predetermined lamp on the switchboard SWBD, informing the operator of the answer. When the switchboard operator operates a disconnect key after confirming the communication between the calling and the called subscriber, the central controller CC similarly detects the operation of the disconnect key and controls the network NW' to disconnect the terminal P of the position trunk PST from the voice channel of the switchboard SWBD.

In Fig. 5, the trunk TRK, the position trunk PST, the common channel signalling equipment CSE and the network NW' are interconnected by non-multiplexed lines, but the digital terminal DT and the network NW' are connected by a multiplexed line (the upward and downward highways UHW' and DHW').

Fig. 6 illustrates in detail the arrangement of an example of the time division network NW' which is applicable to the time division exchange used in Figs. 2A and 5.

In Fig. 6, reference character MPX indicates a multiplexer; TF designates forward time switching stage; S identifies a space switch; TB denotes a backward switching stage; and DMPX represents a demultiplexer. The network NW' is of a known TXSXT three-stage construction. Reference characters $SPMF_1$ to $SPMF_n$ indicate forward speech path memories set up in the forward time switching stage TF; and $SPMB_1$ to $SPMB_n$ designate backward speech path memories provided in the backward time switching stage. The forward speech path memories $SPMF_1$ to $SPMF_n$ are controlled by a control memory CM_1; the backward speech path memories $SPMB_1$ to $SPMB_n$ are controlled by a control memory CM_3; and a gate G of the space switch S is controlled by a control memory CM_2. The forward speech path memories $SPMF_1$ to $SPFM_n$ input multiplexed signals and the backward speech path memories $SPMB_1$ to $SPMB_n$ output multiplexed signals.

Accordingly, the output ends of equipment which handle non-multiplexed signals, such as the trunk TRK, the position trunk PST and the common channel signalling equipment CSE in Fig. 5, are connected to the input ends of the multiplexer MPX, and the input ends of the abovesaid equipment are connected to the output ends of the demultiplex r DMPX. The lines over which multiplexed signals ar transmitted, such as the upward and downward highways UHW' and DHW' can be connected, for instance, to the forward speech path memory $SPMF_n$ and the backward speech path memory $SPMB_n$.

In Fig. 6, reference character SRD indicates a signal receiver and distributor, and CC designates a central controller.

Numerous changes may be made in the above described embodiments. For instance, the number of time slots TS forming the frame F of the PCM highway HW and the arrangement of the time slots according to use are not limited specifically to those shown in Fig. 3 and various other modifications are possible but, in any case, the advantages of the present invention described in the foregoing could equally be obtained. Needless to say, the coded form of the control signal that is transmitted over the common . channel signal link including the common channel signalling equipment CSE and the remote common channel signalling equipment RCSE is not limited specifically to the CITT signalling system No. 7 mentioned previously. Further, the information that is transmitted over the abovesaid common channel signal link is not limited to the control signals of the 30 switchboards. It is also provided that control signals unaccompanied by voice signals, for instance, control signals which do not correspond to individual exchanges, such as control signals representing display information of the centralized display equipment CDE, which indicates the status of exchange service or circuit status, are transmitted together with the abovesaid control signals within the tolerance of the information transmission ability of the common channel signal link (64 K bits/second in Fig. 3). Also in such a case, the same effects as described previously are obtained. Incidentally, the PCM transmission line shown in Fig. 3 is not restricted specifically to the PCM-30 system and may also be of PCM-24 system, for example.

Moreover, in the present invention, the remote common channel signalling equipment and the common channel signalling equipment can easily be duplexed, by which the control signal line can be protected from trouble.

In addition, the load on the processor can easily be decentralized by disposing the remote common channel signalling equipment on the side of the switchboard and the common channel signalling equipment on the side of the time division exchange, that is, by dividing the processor unit into two.

Claims

1. A switchboard control system for a tim division exchange having a plurality of switchboards connected to a time division netw rk, comprising:

a time divisi n multiplex transmission line common to spe ch signals and control signals to be transferred between the switchboards and the time division exchange, for transmitting the speech and control signals on a time-division-multiplexed basis;

a position controller for multiplexing the speech and control signals from the switchboards and inputting them to the common time division multiplex transmission line for transmission to the time division exchange and separating time-division-multiplexed speech and control signals sent via the time division multiplex transmission line from the time division exchange and inputting the separated signals to the switchboards,

wherein the control signals are transmitted via a route including the common time division multiplex transmission line between a common channel signalling equipment provided in the time division exchange and a remote common channel signalling equipment provided in the position controller, and via a control signal line provided separately of a speech signal line between the remote common channel signalling equipment and each switchboard; and

a centralized display equipment on which information of the status of exchange service and circuit status sent out as a display signal from the time division exchange can be displayed for all switchboard operators.

2. A switchboard control system according to claim 1, wherein the control signal line is formed as a common bus.

3. A switchboard control system according to claim 1 or 2, wherein the remote common channel signalling equipment is semi-fixedly interconnected via the common time division multiplex transmission line and the time division network.

Revendications

1. Système de commande de pupitre d'opératrice pour un central à division temporelle comprenant plusieurs pupitres connectés à un réseau à division temporelle, comprenant une ligne de transmission multiplex en division temporelle commune aux signaux de conversation et aux signaux de commande à transférer entre les pupitres et le central à division temporelle, pour transmettre les signaux de conversation et de commande sur une base de multiplexage en division temporelle, un dispositif de commande de position destiné à multiplexer les signaux de conversation et de commande provenant des pupitres et à les introduire sur la ligne commune de transmission multiplex à division temporelle pour la transmission vers le central à division temporelle et à séparer les signaux de conversation et de commande multiplexés en division temporelle émis par la ligne de transmission multiplex à division temporelle provenant du central à division temporelle et à appliquer les signaux séparés aux pupitres, dans lequel les signaux de commande s nt transmis par un itinéraire comprenant la lign commune d transmission multiplex en division temporelle entre un équipement de signalisation de canal commun prévu dans le central à division temporelle et un équipement de signalisation de canal commun éloigné prévu dans le dispositif de commande de position et par l'intermédiaire d'une ligne de signaux de commande prévue séparément d'une ligne de signaux de conversation entre l'équipement de signalisation de signal commun éloigné et chaque pupitre, et un équipement d'affichage centralisé sur lequel des informations sur l'état du service du central et sur l'état des circuits, émis comme un signal d'affichage par le central à division temporelle peuvent être affichées pour toutes les opératrices des pupitres.

2. Système de commande de pupitre d'opératrice selon la revendication 1, dans lequel la ligne de signaux de commande est constituée par une ligne omnibus commune.

3. Système de commande de pupitre d'opératrice selon la revendication 1 ou 2, dans lequel l'équipement de signalisation de canal commun éloigné est interconnecté de façon semi-fixe par la ligne commune de transmission multiplex à division temporelle et le réseau à division temporelle.

Patentansprüche

1. Vermittlungsplatz-Steuersystem für eine Zeitteilungs-Vermittlungsstelle mit einer Vielzahl von Vermittlungsplätzen, die mit einem Zeitteilungsnetzwerk verbunden sind, mit:

einer Zeitmultiplex-Übertragungsleitung, die allen Sprachsignalen und Steuersignalen gemeinsam ist, die zwischen den Vermittlungsplätzen und der Zeitteilungs-Vermittlungsstelle übertragen werden sollen, um die Sprach- und Steuersignale auf einer Zeitmultiplexbasis zu übertragen;

einem Positions-Controller zum Multiplexen der Sprach- und Steuersignale von den Vermittlungsplätzen und zu ihrer Eingabe auf die gemeinsame Zeitmultiplex-Übertragungsleitung zur Übertragung zu der Zeitteilungs-Vermittlungsstelle und und zur Separierung der Zeitmultiplex-Sprach- und -steuersignale, die von der Zeitteilungs-Vermittlungsstelle über die Zeitmultiplex-Übertragungsleitung gesendet worden sind, und zur Eingabe der separierten Signale in die Vermittlungsplätze,

bei welchem die Steuersignale über einen Weg übertragen werden, der die gemeinsame Zeitmultiplex-Übertragungsleitung zwischen einer gemeinsamen Kanalsignalisiereinrichtung umfaßt, die in dem Zeitteilungs-Netzwerk vorgesehen ist, und eine entfernte Kanalsignalisiereinrichtung, die in dem Positions-Controller vorgesehen ist, und über in St uersignalleitung, die separat v n der Sprachsignalleitung zwischen der entfernten g m in-

samen Kanalsignalisiereinrichtung und jedem Vermittlungsplatz vorgesehen ist, und

mit einer zentralen Anzeigeeinrichtung, auf welcher Information über den Status des Vermittlungsdienstes und den Schaltungsstatus, die von der Zeitteilungs-Vermittlungsstelle als Anzeigesignal ausgesendet wird, für alle Vermittlungsplatz-Operatoren angezeigt werden kann.

2. Vermittlungsplatz-Steuersystem nach Anspruch 1, bei welchem die Steuersignalleitung als ein gemeinsamer Bus ausgebildet ist.

3. Vermittlungsplatz-Steuersystem nach Anspruch 1 oder 2, bei welchem die entfernte, gemeinsame Kanalsignalisiereinrichtung semifest über die gemeinsame Zeitmultiplex-Übertragungsleitung und das Zeitteilungs-Netzwerk zwischenverbunden ist.

FIG. 2

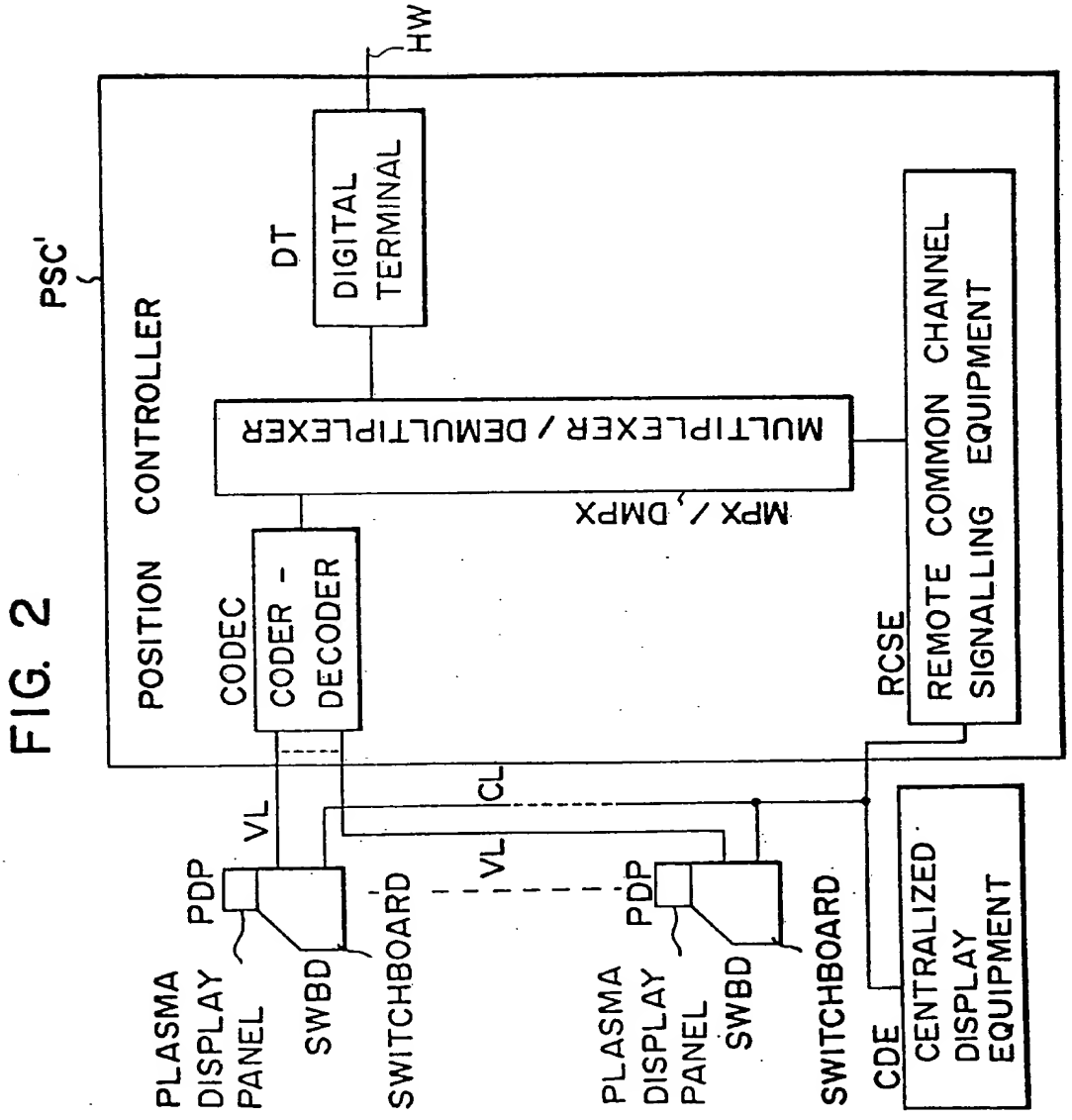

PSC'
POSITION CONTROLLER
HW
DT
DIGITAL TERMINAL
MULTIPLEXER / DEMULTIPLEXER
MPX / DMPX
CODEC
CODER - DECODER
RCSE
REMOTE COMMON CHANNEL SIGNALLING EQUIPMENT
VL
CL
VL
PDP
PLASMA DISPLAY PANEL
SWBD
SWITCHBOARD
PDP
PLASMA DISPLAY PANEL
SWBD
SWITCHBOARD
CDE
CENTRALIZED DISPLAY EQUIPMENT

FIG. 2A

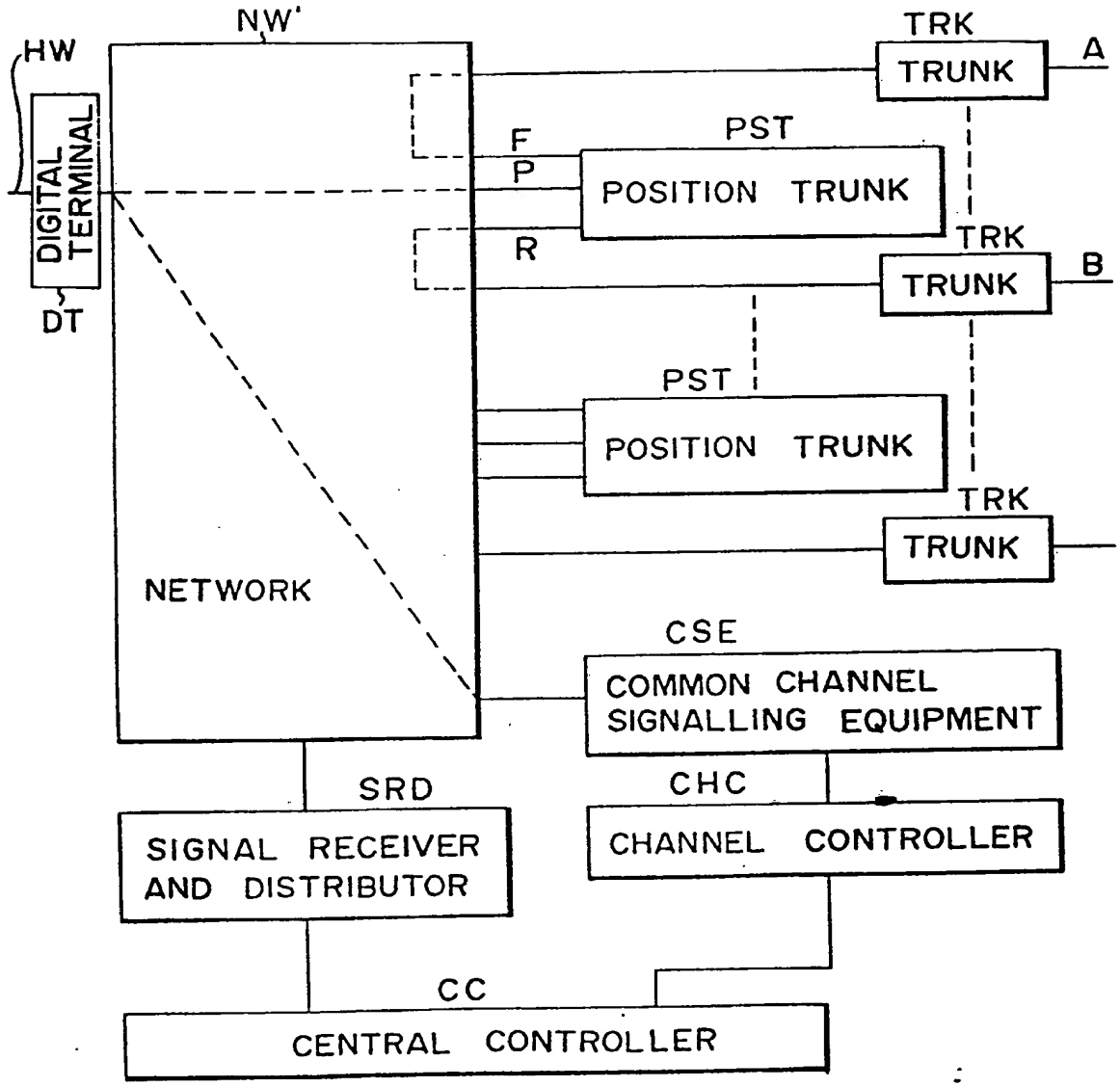

NW
HW
DIGITAL TERMINAL
DT
TRK
TRUNK
A
F
P
R
PST
POSITION TRUNK
TRK
TRUNK
B
PST
POSITION TRUNK
TRK
TRUNK
NETWORK
CSE
COMMON CHANNEL SIGNALLING EQUIPMENT
SRD
SIGNAL RECEIVER AND DISTRIBUTOR
CHC
CHANNEL CONTROLLER
CC
CENTRAL CONTROLLER

FIG. 3

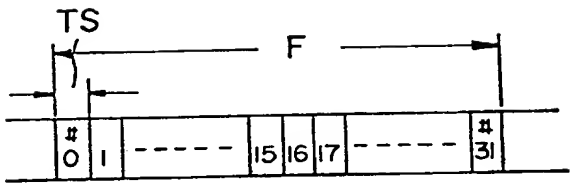


FIG. 4

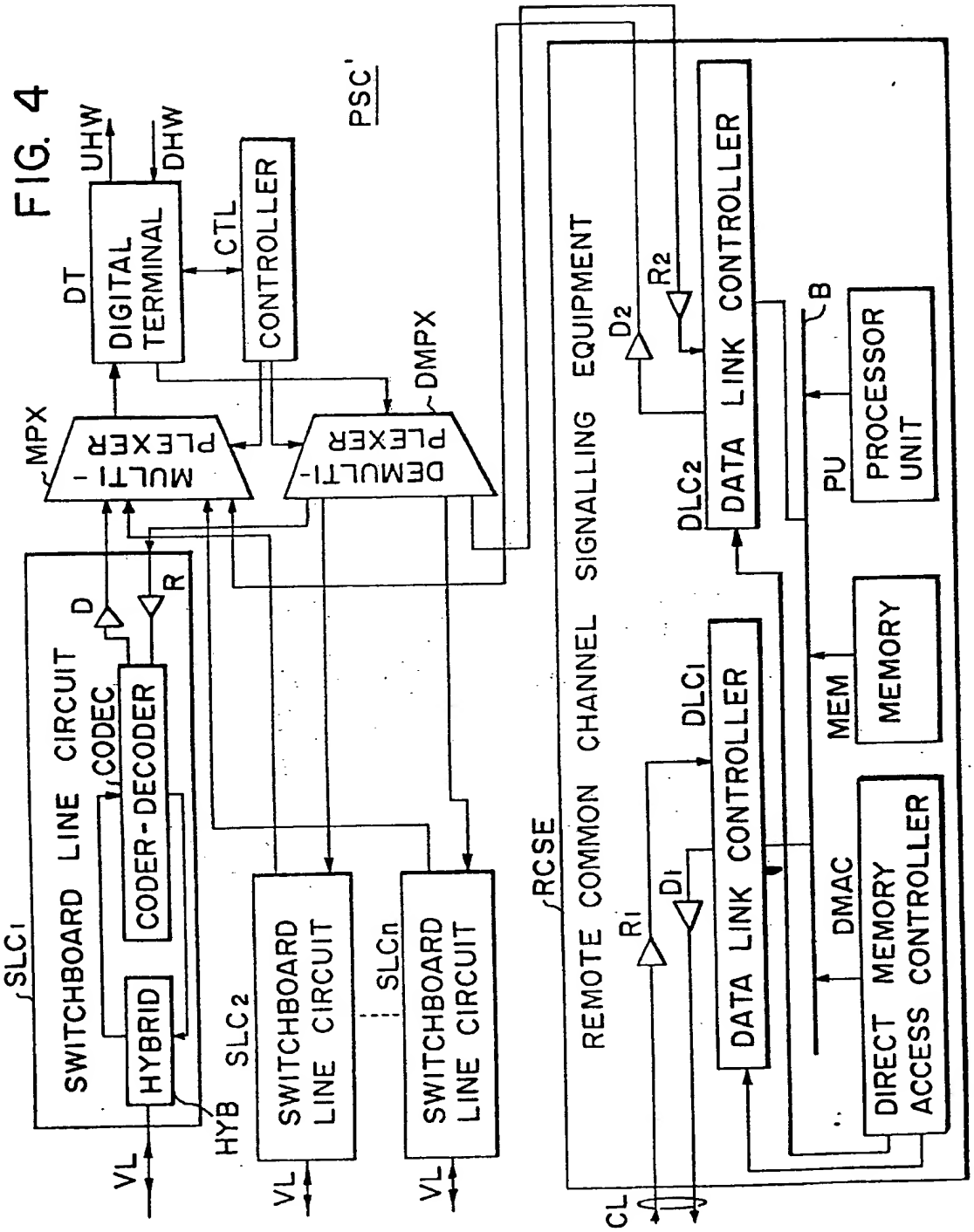
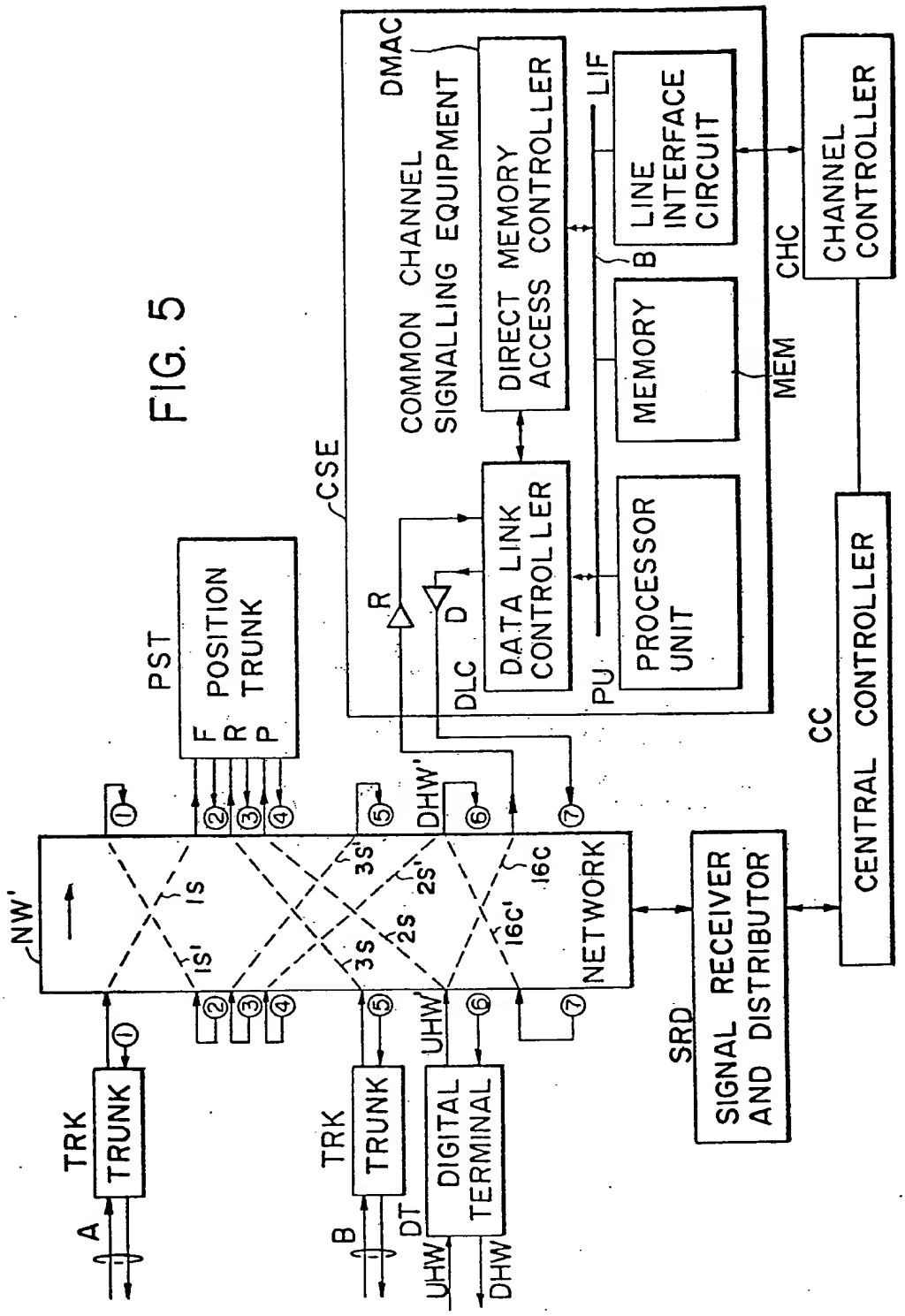

PSC'
DT
DIGITAL TERMINAL
UHW
DHW
CTL
CONTROLLER
MPX
MULTI-PLEXER
DMPX
DEMULTI-PLEXER
SLC1
SWITCHBOARD LINE CIRCUIT
D
R
CODEC
CODER-DECODER
HYBRID
HYB
VL
SLC2
SWITCHBOARD LINE CIRCUIT
SLCn
SWITCHBOARD LINE CIRCUIT
RCSE
REMOTE COMMON CHANNEL SIGNALLING EQUIPMENT
D2
R2
DLC2
DATA LINK CONTROLLER
B
PU
PROCESSOR UNIT
MEM
MEMORY
DMAC
DIRECT MEMORY ACCESS CONTROLLER
R1
D1
DLC1
DATA LINK CONTROLLER
CL

FIG. 5


NW'
NETWORK
1S
1S'
2S
2S'
3S
3S'
16C
16C'
DHW'
UHW'
PST
F POSITION
R TRUNK
P
CSE
COMMON CHANNEL
SIGNALLING EQUIPMENT
DMAC
DIRECT MEMORY
ACCESS CONTROLLER
DATA LINK
CONTROLLER
DLC
D
R
PROCESSOR
UNIT
PU
MEMORY
MEM
LIF
LINE
INTERFACE
CIRCUIT
B
CHC
CHANNEL
CONTROLLER
CC
CENTRAL CONTROLLER
SRD
SIGNAL RECEIVER
AND DISTRIBUTOR
TRK
TRUNK
A
TRK
TRUNK
B
DIGITAL
TERMINAL
DT
UHW
DHW

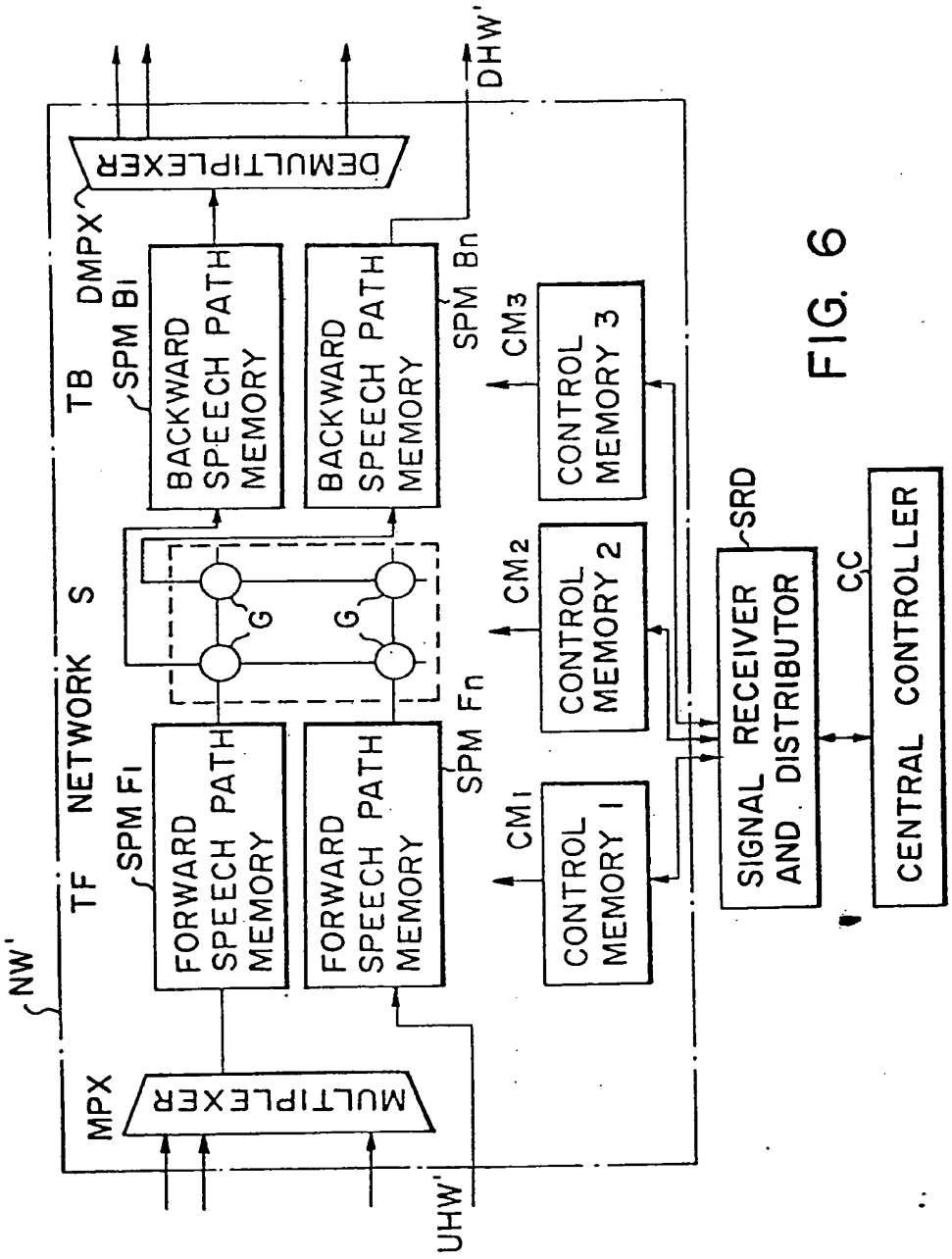

NW'
TF NETWORK S
TB DMPX
MPX
MULTIPLEXER
DEMULTIPLEXER
SPM Fi
FORWARD SPEECH PATH MEMORY
SPM Bi
BACKWARD SPEECH PATH MEMORY
SPM Fn
SPM Bn
G
CM1
CONTROL MEMORY 1
CM2
CONTROL MEMORY 2
CM3
CONTROL MEMORY 3
SRD
SIGNAL RECEIVER AND DISTRIBUTOR
C,C
CENTRAL CONTROLLER
UHW'
DHW'

FIG. 6